

INTERNATIONAL CITY MANAGERS' ASSOCIATION

1313 EAST 60TH STREET - CHICAGO 37, ILLINOIS

Report

125 June-'54

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ADMINISTRATION OF A MUNICIPAL STREET TREE PROGRAM

What are the purposes of a municipal street tree program? How is such a program established, financed, and carried out?

Many cities are beginning to realize the long-term community value of a municipal program for the control and development of street trees. This is demonstrated by the growing number of cities which have established programs ranging from complete municipal care of street trees to a permit system of street tree regulation. The purposes of this report are to make suggestions for city officials in developing a street tree program and to review some current administrative and financial practices in selected cities.

Street trees include all trees located on municipal rights-of-way for streets, boulevards, parkways, and other types of streets. This report describes the purposes and benefits of a municipal street tree program, the possible extent of such a program, the legal authorization and planning needed, methods of financing, and administrative and regulatory procedures. Data on administration, personnel, and cost are shown for selected cities.

Purposes and Benefits

Street trees provide many benefits which are essential to the welfare of the community. Trees relieve the drabness of streets and provide cooling shade and beauty which greatly enhance living conditions. Trees also help to reduce traffic noises, deflect glare and heat, cut down wind velocities, and purify the air by trapping dust, absorbing carbon dioxide, and releasing oxygen and moisture into the atmosphere. They are conducive to a sense of mental well-being, comfort, and civic pride. No better illustration can be had than a personal comparison of a beautiful tree-lined street with a street that is barren.

The economic value of street trees can hardly be ignored. On one tree-shaded residential avenue, street trees which cost \$4 apiece a number of years ago are now considered to be worth at least \$150. In another instance the Massachusetts Forestry Association on the basis of a survey of real estate men has stated that trees increase the value of adjoining land 40 per cent. Officials of Detroit, Michigan, have stated that a conservative judgment of the value of the city's street trees would be \$60 million.

Failure on the part of the city to maintain its street trees may result in costly expenditures. Various studies show costs of from \$50 to \$80 to remove a dead tree. This expense can be greatly reduced through a good tree program. It is obvious that it is cheaper in the long run to provide proper tree care than to remove those that have died from causes that could have been avoided. Cities which have ignored the importance of a street tree program have been faced with multiple problems such as crowding of trees because of bad spacing in planting and wrong selection of species resulting in disrupted sewer and water mains.

broken sidewalks, interference with street and traffic lighting, and obstruction of overhead utility wires.

Failure to take preventive action against epidemic tree diseases has resulted in the loss of hundreds of thousands of street trees. In one city over 20,000 American elms were reported victims of a virus disease and, according to authorities, the remaining estimated 195,000 elms will undoubtedly die. In another city several years ago 10,000 trees were killed in one year by a deadly fungus, the cankerstain disease.

Trees and tree limbs that fall upon streets, sidewalks and private property may injure a person seriously or cause extensive property damage. According to McQuillin (The Law of Municipal Corporations 1945, Vol. 7, Sec. 2965, p. 180), "a municipality is liable, in case of negligence, to persons in a street injured by the falling of a tree being cut down by its employees; or, according to the more prevalent rule, by the falling of a decayed tree or limb thereof, where it had notice of the dangerous condition a sufficient length of time. In some states, however, liability is denied on the theory that the duty to remove dead trees or limbs is a governmental duty, but it is to be noticed that the states in which liability is denied are those where it is held that there is no common law liability for defective streets and the only liability is that imposed by the statute. However, in any case, there is no liability unless the municipality had actual or constructive notice of the condition of the tree."

The street tree problem must be approached from a long-range point of view. Many cities are faced with the problem of trees planted too close together and the wrong species of trees, with the result that the growth of tree roots creates serious problems in repairing sidewalks, curb and gutters, and sewer pipes. A long-range program will call for the replacement of street trees with the proper kind of trees, attaining some degree of uniformity along individual streets, and the setting up of an organization and procedures for the proper handling of all stages of street tree work.

Extent of the Program

A good street tree program calls for careful planning and the realization that the city will have to exercise extensive control. In determining the program, city officials should call upon a qualified professional city forester or arborist who should be relied upon to evaluate the needs of the city and to present recommendations. The professional forester's work includes a complete street tree inventory and the drafting of a master street tree plan. The plan should include all phases of planting, care, and removal.

The main task of city officials in determining the program will be one of weighing the recommendations of the professional city forester with the financial capacity of the city to undertake the program. A basic decision that must be made at the outset is the degree of responsibility to be undertaken by the city. The alternatives are: (1) complete responsibility in which the city will do all work on street trees and pay the total cost, (2) limited responsibility under which the city will do some of the work, especially on major thoroughfares, and regulate and supervise street tree work in other areas, and (3) regulation and supervision under which the city will do none of the work or pay any of the cost but merely control the planting, spraying, trimming, and removal of street trees under a permit system.

Complete Municipal Responsibility. It is the opinion of professional city foresters and arborists that a sound program for street trees calls for complete responsibility on the part of the city. The National Shade Tree Conference, for example, favors the policy of the city assuming complete control of all tree planting, maintenance, and removal practices and recommends that sufficient monies should be provided for such service from general funds or assessments covering the whole city. William B. Love, specialist in municipal forestry and parks, states that: "The ideal street tree program should be set up with the idea in mind that the city will plant, remove, and care for street trees without special assessment against the abutting property. All regulations and work on street trees should be based on the right of the municipalities to control the street for purposes of travel and safety."

Limited Municipal Responsibility. Under a policy of limited responsibility the city would adopt a master street tree plan covering all streets in the city but street tree work would be planned and carried out only on major thoroughfares. On residential streets the city would do work only upon petition of the property owners and make individual charges or assess the cost against abutting property. Under a program of limited responsibility the city would do all the work, either with its own employees and equipment or by private contract, but the cost of the program would be paid by both annual appropriation from general funds and special assessments or charges.

Another type of tree program under which the city has only limited responsibility is illustrated by the policy of Ames, Iowa. That city still maintains existing street trees but last year abandoned the municipal tree nursery and now encourages property owners to plant trees back of the sidewalk instead of in the parking strip. The city has adopted the policy that parking strips should be used for the installation of utility lines, that trees should be planted as far back from the curbs as possible to get maximum benefit from street lighting, and that maintenance of trees should be the responsibility of individual property owners. Planting of trees in the parkway is discouraged and the city is considering the prohibition of tree planting in the parkways of new subdivisions. Ames officials believe that trees planted on private lawns create an attractive street. The city plan commission has made a comprehensive survey of existing trees and has prepared a report on desirable trees for planting.

Municipal Regulation. A program of regulation and supervision of street trees is the most limited of the three alternatives. This program may be described as negative in its approach. The city limits itself to prohibiting the planting of certain species of trees and requires all work on street trees to be done by permit only. The city does not work on street trees but merely provides that residents, or persons hired by the resident, obtain a permit to plant, spray, trim, or remove street trees. Inspections are made by the city after the work has been accomplished to determine whether the work has met the provisions of the permit.

Any work on street trees done by the city is limited to the removal of dead or diseased trees and trimming of trees which, because of their hazard, may make the city liable for damages. The National Shade Tree Conference considers this program the least acceptable. This association of shade tree experts considers the issuance of permits for certain practices as provided for in ordinances should be considered only as a necessary temporary measure in some cities. The association further states, "The issuing of permits is, in its end result, an unsatisfactory policy."

In the final analysis it would seem that a city should really make a choice between the first two alternatives--a program of complete responsibility or one of limited responsibility. There is in either case a master street tree plan and complete control is exercised by the city. In both instances all street tree work is done by the city but the essential difference between the two programs is that in the first instance the city must undertake all of the cost and in the second the city and the benefited property owners share the cost.

Legal Authorization

Authority to establish and administer a street tree program should be based on the authority of the city to control streets. Under constitutional provisions and state statutes municipal corporations generally have control of their streets and may legislate concerning them within reason. The courts have held that the maintenance of trees in a street for the purposes of ornament and shade is a proper street use sanctioned by the custom of the country and in some jurisdictions by statute. Individual cities will have to be guided by the laws of their particular state.

Statutes should be checked for laws concerning public improvements, special assessments, and the regulation and control of streets by the municipality. One example of state legislation affecting a city's street tree program is to be found in Minnesota. Under state law, cities of the first class having a population of 450,000 or more (Minneapolis) may assess the cost for the care, removal, and trimming of trees along the streets and avenues and alleys of the city against abutting and benefited property. The assessment is limited under the law to an amount not to exceed 15 cents per front foot and the assessment may be made only once in five years.

There is apparently little question as to the authority of the city to cut and remove trees where they constitute a nuisance or for the purpose of making authorized public improvements. Sufficient legal authority exists for the formulation of what may be described as a negative program; that is, a program wherein the city may remove dead or hazardous trees, prohibit mutilation of existing trees, and provide for trimming in the case of nuisance or hazard. Cities may have to work for additional legislation which will enable them to undertake a positive program. A positive approach calls for the city to take complete responsibility for the planting and maintenance of all street trees within the city limits.

Tree Ordinance. An important step in establishing the street tree program is to adopt a street tree ordinance. Provisions of the ordinance will depend, to some extent, upon the kind of program the city wishes to carry out. There are, however, some elements in the ordinance which are applicable regardless of the kind or extent of the program. These provisions are summarized as follows: designation of the official who is responsible for administering the program; the department, division, or bureau which is to carry out the work; reference to the street tree plan if one is adopted, or the species of trees prohibited and those approved, as well as the location, spacing, and size of trees; procedures for planting and removing of street trees; causes for removal (nuisance and hazard); procedure for the issuance of permits; protection of trees from injury and damage; relations with electric utilities; house moving (approval of routes to be taken); public safety provisions requiring private property owners to remove or trim overhanging or hazardous trees and provisions for requiring control of or removal of privately owned trees infected with a contagious disease;

assessment of costs; hearing procedures; and penalties resulting from the violation of the ordinance.

Among the cities which have adopted comprehensive tree ordinances in recent years are Beverly Hills, Merced, Pasadena, San Gabriel, and Sunnyvale, Calif.; Evanston, Ill.; Ames and Des Moines, Iowa; Ann Arbor, Bay City, Detroit, Escanaba, and Lansing, Mich.; Minot, N. D., and Cleveland and Toledo, Ohio. In addition to these individual city ordinances, the National Shade Tree Conference has published a suggested model ordinance and the state municipal leagues in Michigan, Oregon, and Washington have published reports containing model ordinances (see Bibliography at end of this report).

Master Street Tree Plan

To establish a complete street tree program the city should adopt a master street tree plan. Such a plan should be drawn up with the help of a professional city forester or arborist. All streets within the city limits are included in the plan. Existing trees are plotted, and where unsuitable, indications are made for removal and replanting. New plantings are charted for all streets as well as the width of planting space, distance between trees, setback of buildings, overhead wires, the location of street lights, traffic lights, atmospheric conditions, and the character of the neighborhood and the possibility of a change in zoning regulations. Once adopted, the plan should be adhered to; however, it should be flexible enough to permit reasonable and necessary changes.

San Gabriel, Calif., in establishing its street tree program, appointed a parkway tree committee of the planning commission to study the condition of parkway areas within the city and to suggest means of improving them. A survey of all parkway areas was completed and the committee studied in detail the factors involved in formulating a definite program. In making its study the committee consulted with a professional landscape architect and obtained specific recommendations for a street tree program. The work of the committee resulted in the drafting and enactment of a tree ordinance, the adoption of an official tree and shrub list, a policy for tree removal and planting, and a proposed ten-year parkway tree program. The program outlined the volume and nature of tree work, scheduling, and estimates of total and annual costs.

In Pasadena, Calif., the master street tree plan is outlined in an official street tree list which has been published for distribution. The street tree list includes the names of all streets, park area width, street width, soil type, and the officially designated tree for planting. A street map of the city is appended. Other cities, as in Ames, Iowa, and Sunnyvale, California, also have prepared lists of approved trees. Lists of the most desirable kinds of trees in any particular area of the country generally can be secured from the state department of forestry, agriculture, or other state agency.

Real Estate Subdivisions. Current problems with relation to street trees that have resulted from poor policy may be avoided by cities in new areas which are presently being developed. Street trees in new subdivisions may be considered just as important as water and sewer mains, street lights, or sidewalks. By requiring real estate subdividers to plant street trees in accordance with a master street tree plan, both the city and future property owners will benefit.

According to the 1953 Municipal Year Book 80 out of 509 reporting cities over 10,000 population that have comprehensive land-subdivision regulations require

developers to plant street trees in new subdivisions. Most of the regulations provide that street trees are to be located and planted wherever required by the planning board and species of trees must be approved by the board. Because of the variation of street requirements and planting conditions, granting the board discretionary authority is preferable to detailed requirements for plantings and intervals that would not be applicable for all subdivisions. Clauses found in the regulations of San Mateo County, Calif., and Dayton, Ohio, regarding planting easements, and by Hastings-on-Hudson, N. Y., and Akron, Ohio, regarding bonds covering planting have been cited as valuable additions to general planting regulations.

The following clauses in a platting regulation are recommended to assure the planting and preliminary maintenance by the subdivider of a sufficient number and proper variety of street trees to satisfy the varying requirements of street uses and condition: "Street trees shall be planted wherever required by the planning board in conjunction with the park commissioner, and the trees shall be of size and species approved by them. The subdivider shall post a bond covering the cost of planting these trees and the cost of their maintenance for two years after planting. Planting easements along the street frontage not exceedingfeet in width, may be required by the planning board." (From Harold W. Lautner, "Subdivision Regulations: An Analysis of Land Subdivision Control Practices." [Chicago: Public Administration Service, 1941], p. 114.)

A program which consists mainly of maintaining street trees is far less costly than a program involving numerous new plantings on miles of barren streets. The problems of additional revenue, special assessments, and administration of a street tree program will be greatly reduced if positive action is taken by the city at the time of the development of the subdivision.

Financing the Program

Most cities finance their street tree programs from the general funds. A few cities levy a special street tree tax which of course is subject to the general criticism of special fund administration. Another method of financing the street tree program is to divide the city into local improvement districts, estimate the cost of the street tree program within the district, and then make special assessments on all real property lying within the district. One practice is to assess the abutting property on a front foot basis.

The Des Moines, Iowa, ordinance provides assessments for new plantings may be made by the city council after notice and hearings. The department of parks and public property is made responsible for certifying the cost of plantings and maintenance, the amount of special assessment, the lots or specific portions thereof to be assessed, and the names of the property owners. Upon adoption by the council the special assessment for street trees is collected in the same manner as other special assessments.

Where the city does street work only at the request of the individual property owner, the city may make special charges based on the kind and amount of work done. The cost of treating, trimming, or removing trees on private property which are declared to be a hazard is legitimately the responsibility of the property owner. The city may do the work in special instances and charge the property owner; however, it is a better policy to require the property owner to have the work done by a private contractor.

A possibility that should be investigated by cities is the use of gasoline tax moneys to help finance its street tree program. The outer boundaries of a public street are often considered to be the private property lines. The street then includes the sidewalks and the parkways. Street maintenance and improvement should be interpreted to include the street trees, since street trees have a direct relationship with street lighting and traffic control.

Costs of a street tree program will vary dependent upon the extent of the program (degree of responsibility undertaken by the city), street mileage involved in the program, and the condition of the trees. Data compiled in a street tree survey should reveal conditions and needs for planting, pruning, repair, spraying, and removal. On the basis of these data personnel and equipment needs may be determined. The amount of street tree work to be done by the city, of course, will have a tremendous effect on the final estimated cost. The cost of the street tree program in selected cities is shown in a table included in this report.

In making comparisons of costs for street tree programs in the various cities listed, factors other than street mileage should be kept in mind. The initial appropriation necessary for a new tree program will be much greater than appropriations needed in subsequent years when maintenance of street trees becomes the main activity. Initial costs include such things as a street tree survey, new equipment, and additional personnel, as well as stocks of new trees for plantings and replacements. Where a program has been in effect for several years, costs should decline accordingly.

Organization for Municipal Tree Work

It is important that the official agency responsible for the program be defined in the ordinance. The official head of the agency should be a professional city forester or arborist. In any case, a professional city forester should be employed in the department. Fox Point, Wis., despite its small population (2,585), employs a full-time forester to supervise the proper planting of trees. He has full charge of the work of pruning and trimming and developing existing plantings. The cost of plantings in parkways is assessed against property owners.

A good street tree program calls for constant planning and scheduling of work and for this reason responsibility should not be delegated as an additional or minor duty to a department whose major task is totally unrelated to street tree work. The principal factor determining which agency or individual is to be made responsible for enforcing the tree ordinance is apparently a question of which department has the manpower and equipment necessary for carrying out the operation. In many cities it is the department of parks because the work of this department centers around operations closely related to trees.

Personnel and Equipment. For the administration of the municipal street tree program, the city should employ a person who has a college degree in municipal forestry, horticulture, or the equivalent in experience in arboriculture. In many cities he is given the title of city forester. This person should be responsible for the development of the program, procurement of equipment, and the hiring, training, and supervision of tree workers. In small communities where the amount of street tree work is limited, it may be well to consider contracting the work out to a responsible tree service concern. In Kent, Ohio, the city has taken complete jurisdiction over tree care and has found it

more economical to contract with a private firm to do the work. Tree work is hazardous for the inexperienced and supervision should be adequate at all times.

Specialized tree maintenance equipment is necessary. Ropes, saddles, pruning saws, pull pruners, and ladders, which are required for equipping maintenance crews should be of the best quality and should be maintained at all times in a good usable condition. Heavy equipment, such as sprayers, brush chippers, and air compressors, represent a considerable investment and careful consideration should be made of the use of such equipment and the best type before purchasing. Where the use of heavy equipment will be limited, it may be more economical to rent equipment or to contract out specialized work such as spraying.

Municipal Tree Nursery. Most municipalities have found it more economical to purchase planting stock directly from commercial nurseries. Some cities, such as Detroit, Mich.; Toledo and Cleveland, Ohio; and Sunnyvale, Calif., maintain city tree nurseries. The problems and costs involved in operating a city nursery should be thoroughly investigated before establishing it. It is essential to have a good nursery manager and a suitable nursery site if a nursery operation is to be successful and profitable. Some cities purchase small size trees and line them out in the nursery with adequate spacing for cultivation and training until grown to a suitable size for street planting. Sunnyvale, Calif., uses undeveloped city land for storing trees in one-gallon cans. These trees are raised from small low-cost cuttings to an adequate size for planting. The total capital outlay for approximately 3,000 trees was \$1,500.

Regulation of Private Tree Work

Permit Procedure. Where the city regulates street tree work, permits should be required for all work affecting street trees, including planting, removal, trimming, spraying, pruning, and treatment for injured or damaged trees. Permits should be issued only to persons qualified to do the work. Applications for permits should be made at the office of the agency designated in the ordinance and they should be made well in advance of the time the work is to be done so that inspection and approval can be made. Work on street trees should be done in an approved manner within a reasonable length of time after the permit is issued. To ensure conformance a prompt report of completion of the work should be required and final inspection should be made by the city.

When issuing permits to private property owners who wish to arrange for tree work, the division of forestry in Lansing, Mich., provides suggestions and advice to guide the property owner. Individuals or firms that may be hired to do the work are suggested and the property owner is advised to reach an understanding or agreement with the individual or firm on the following points: (1) costs, hourly rates, total estimated hours, or total contract price; (2) disposal of wood, brush, or refuse material; (3) responsibility in case of damage to lawn or plants; (4) tree stumps to be left or cut below surface of ground; (5) name of the disease, or insect pest to be treated; (6) kind of spray material and the number of applications; (7) amount and type of tree fertilizer to be used; (8) insurance covering injury to tree workers, property, and passer-by. This policy has resulted in raising the standards of private tree service operators and the quantity and quality of work done. The fly-by-night nonprofessional operator has disappeared from the city.

Licensing. Authorities in the field of forestry are in general agreement that only competent people should be permitted to do tree work. An outstanding

example of the regulation of private tree work is found in Evanston, Illinois. Evanston requires all persons or corporations doing tree work within the city to obtain a license. Applications for a license must contain the usual factual information on name, address, etc., but also must contain a brief statement of the experience of the person or firm doing tree work. Applications are first submitted for approval to the commissioner of streets, whose duty it is to require the applicant to submit to and pass a reasonable examination, either oral or written, or both.

The conditions of the examination in Evanston are prescribed by the commissioner for testing the qualifications and fitness of the applicant to perform tree work. If the application for license is approved, before doing any tree work the person or firm must post a bond in the sum of \$10,000 with surety to be approved by the commissioner of streets as a condition for the faithful performance of tree work under the control and supervision of the commissioner of streets. The city clerk may not issue a license until the application has been approved and the bond posted.

The nature of street tree work and the possibility of damage indicate that the licensing of individuals or firms doing street tree work would be a wise policy. Procedure for obtaining a license should include an examination as to competence as well as the other usual requirements associated with business licensing.

Relations with Public Utilities. Under certain conditions, blanket permits may be granted to persons or corporations who find it necessary to trim trees for the improvement of public utility services. It should be pointed out that there is some disagreement on the issuance of blanket permits to public utility corporations.

Lansing, Mich., has a policy of permitting telephone company employees, or a private firm hired by the telephone company, to prune side branches up to 1-1/2 inches in diameter. They are not allowed to prune top or leader branches. Any branch larger than 1-1/2 inches in size is referred to the assistant forester for decision as to whether it can be removed or whether the cable or wires should be rerouted so as not to interfere with the tree branch in question. Although Lansing permits the telephone company to do continuing street tree work, certain precautions are taken. All work is checked by city inspectors. If the telephone company employs a private tree firm, the firm must be approved by the forestry division. The only telephone company employees who are permitted to do pruning work are those who have completed training under a city instructor. Each employee carries a written statement attesting to his competence to do the pruning necessary to clear home service wires of small branches.

Special Problems

Species of Trees. Climate, soil, moisture, and atmospheric conditions are limiting factors which determine which species of trees are best suited for planting. The local county agricultural agent or the state agricultural colleges and universities are good sources of information on the best species of trees for particular areas. Other sources of information are state agricultural departments and forestry agencies.

Only desirable species of trees that are well adapted to local conditions should be planted. For best over-all results it is usually better to confine the planting on individual streets to one variety. Six or more acceptable

ORGANIZATION AND OPERATION OF STREET TREE PROGRAMS
(Obtained by Questionnaire, May, 1954)

City and Population (in thousands)	Master Tree Plan	Agency in Charge	Profes- sional Arborist	No. of Em- ployees on Tree Work	Expenditure on Tree Work, 1953	Street Mileage	Municipal Nursery	Private Tree Work	
								License; Examina- tion	Bond Re- quired
Ames, Iowa	23	No	Pub. Wks.	No	\$ 5,819	55	No	No	No
Ann Arbor, Mich.	48	No	Div. Shade Trees	7	25,498	100	Yes	No	No
Bay City, Mich.	53	No	Div. Pks	15	31,042	190	Yes	No	No
Beverly Hills, Calif.	29	Yes	Pk. Dept.	29	110,106	96	No	No	...
Cleveland, Ohio	915	Yes	Div. Shade Trees	130	530,000	1,400	Yes	No	No
Des Moines, Iowa	178	No	Div. Forest.	20 ¹	99,833	622	Yes	No	No
Detroit, Mich.	1,850	Yes	Div. Forest.	165 ²	1,000,000	2,811	Yes	Yes-Yes	No
Escanaba, Mich.	15	Yes	Pks. & Forest.	33	12,880	30	Yes	No	No
Evanston, Ill.	74	No	Div. Pks.	5	60,000	125	No	Yes-Yes	Yes
Hartford, Conn.	177	Yes	Div. Forest.	13	...	215	Yes	No	No
Kansas City, Mo.	457	No	Pub. Wks.	38	97,204	1,000	Yes	Yes-No	No
Kent, Ohio	12	...	Shade Tree Comm. (3 man bd.)	...	...	...	...	...	...
Merced, Calif.	18	No	Div. Pks.	2	8,232	60	No	Yes-No	No
Minneapolis, Minn.	522	Yes	Park Bd.	40	225,000	1,001	Yes	Yes-No	Yes
Minot, N. D.	22	No	Pub. Wks.	...	...	...	No	No	Yes
Pasadena, Calif.	105	Yes	Div. St. Trees	38	170,050	340	Yes	No	Yes
San Gabriel, Calif.	20	Yes	Engr.	3	18,000	60	No	Yes-No	No
Sunnyvale, Calif.	16	Yes	Div. Pks.	7	5,200	53	Yes	Yes-No	No
Tacoma, Wash.	144	No	...	...	...	...	No	No	No
Toledo, Ohio	304	Yes	Div. Forest.	33	156,971	643	Yes	No	...

1. Equivalent of 4 additional employees for seasonal work.
2. 100 additional employees do seasonal work.
3. 3 additional employees do seasonal work.

species should be selected for planting throughout the city to provide variety and to reduce the possibility of an epidemic disease or insect infestation affecting a large percentage of trees. Cities should avoid planting weak-wooded, fast-growing species that are susceptible to storm damage, trees with aggressive root systems that may invade sewer lines, and trees that bear objectionable fruit. Chinese or Siberian elms, box elders, willows, cottonwoods or poplars, catalpas, mulberrys, horsechestnuts, black locust fruit trees, and silver maples have objectionable features that make them unsuited for street planting in most cases.

Large species of trees should not be planted where there is insufficient space for root, trunk, and crown development. Small and medium-size growing trees are better adapted for narrow streets, narrow planting areas, and under utility wires. Small or medium-size trees usually require less maintenance and are less costly to remove than are the large trees. Large types of trees should be used, however, where possible, since they usually develop into good shade trees quicker than the relatively slow growing small trees. Large trees will provide much better shade than the smaller varieties where there is sufficient space for them to grow. Thus, trees should be fitted to the space available. The use of pyramidal, upright, and globe forms as functional trees makes it possible to correlate ground space, setback, overhead wires, street lights, and so on.

Location of Planting. Consideration of existing trees and new plantings should be an integral part of every subdivision plan and plans for the installation or relocation of any street or sidewalk. Proper attention to the location of curbs, sidewalks, and buildings to provide space for tree planting and growth will help to insure a good street tree development.

Ideally the planting strip between curb and sidewalk should be at least ten or more feet in width and buildings should be placed at least 25 feet or more from the street line. Where space permits, trees should be planted well back from the curb but at least four or more feet from the sidewalk, alleys, drive-ways, hydrants, and shut-off valves for water or gas services. The minimum planting strip should not be less than four feet in width and where space is limited small or medium-size trees should be used.

On streets where the planting strip is narrow there may be adequate space back of the sidewalk for planting on private property. Consideration should be given to locating plantings at least four feet in back of the sidewalk in such instances. Before this is done a written agreement should be made with the city and the property owner covering such factors as planting, maintenance, and eventual removal of the tree. This type of planting makes the street appear wider and interferes less with traffic clearance, street lighting, and snow removal.

Larger varieties of trees should be spaced at least 50 or more feet apart and a spacing of 60 to 75 feet may be better in many instances. Minneapolis requires that trees be spaced 66 feet apart. Medium-sized varieties require a spacing of 45 to 50 feet and small trees 35 to 45 feet. It is usually desirable to stagger or alternate planting locations on opposite sides of the street to prevent crowding over and across the street. Fewer trees well spaced will have more room for full development and permit better air circulation and better street lighting. In addition, maintenance and eventual removal costs are reduced by fewer well-spaced trees.

Plantings should be set back from corners or street intersections at least 20 feet to provide safe vision for traffic. Trees and shrubs for boulevard planting should be so selected and spaced as to permit room for growth and to provide adequate traffic clearance for vision. Masses of shrubbery that provide a hiding place for the criminally inclined or for children to dart out into traffic should be avoided. Shrubs and low-growing trees should not be permitted where they will interfere with pedestrians or safe traffic conditions. The city tree ordinance should prevent planting or require the removal or trimming of shrubs on private property where they interfere with public safety.

Tree Pruning and Spraying. A pruning schedule should be planned so that trees will be pruned every four to five years or oftener if needed. Safety signs and barriers should be used when trimming or removing trees in order to protect the public. Flagmen should be stationed in the street to warn pedestrians and traffic of danger, and red lanterns or flares placed on barriers or obstructions remaining in traveled portions of the street or sidewalk after dark.

Careful pruning of young trees will eventually develop a well-branched crown and reduce decay entering the tree from stubs and dead branches. Heavy pruning that will expose shaded portions of the tree to sun injury should be avoided. Trees should be trimmed to allow free passage of pedestrian and vehicular traffic, eight to 10 feet over sidewalks, and 12 feet over all streets except principal thoroughfares which should have a clearance of at least 16 feet.

Ferndale, Michigan, reports that in a 25-week period 2,918 elms with an average diameter of 15 inches were trimmed at an average cost of \$6.28. The total cost of the program amounted to approximately \$18,300. The city reports that the factors other than the size of the tree which affect the cost of trimming are: (1) the weather--wet trees slow down operations; (2) traffic--trimming is slowed down on high traffic streets and around schools, especially when students are going and coming from classes; and (3) the size of the trimming crew.

The size of a trimming crew was found to be especially important in controlling costs. For trimming operations it is necessary to have a groundsman and equipment on hand at all times. These nontrimming costs should be spread over the greatest number of men possible. Ferndale reports the most efficient crew contains four or five trimmers and one groundsman. Increasing the number of trimmers above this point calls for another groundsman or the use of a trimmer to do the job. Decreasing the number of trimmers meant that the groundsmen had idle time. In any contract with private companies arranged on a per hour rather than a per tree or per job basis, the size of the crew should be stipulated.

For spraying operations Ferndale found after an examination of bids received that it would be cheaper for the city to do the work itself. A sprayer was rented from a neighboring city, and a total of 754 trees were sprayed at an average cost of 87 cents per tree, which constituted a saving of \$1.65 per tree under the bid price.

Spray controls are applied with either hydraulic or mist sprayers. The mist-blower type of sprayers are usually best suited for street tree sprayings since they are more economical for spray materials, provide more rapid coverage, and are less likely to cover cars and walks with objectionable spray materials. The mist-blower operators report few complaints from property and car owners.

Tree Removals and Disposal. Tree removal programs create the additional problem of disposing of the wood. Removal of large trees is very costly and most cities have found there is little market for the logs from which to obtain revenue to help defray the cost of removal. Proper disposal is especially important in the case of elm logs which must be burned or debarked if they are diseased. Those cities which have incinerators may be able to effect a saving in the cost of purchased fuel by using logs cut and split to suitable sizes.

Another method of disposal employs the use of a comparatively new machine called a wood chipper. This machine will take logs not exceeding eight inches in diameter and will quickly turn them into chips or shavings which are valuable for animal bedding, and after such use or without it, make good mulch.

Kansas City, Mo., has purchased a machine that takes tree branches up to five inches in diameter. Branches from fallen, trimmed, or hewn trees are fed into a hopper, go through cutters, and come out through a blower into the cage of a truck. The truck hauls about as many of the chewed branches as five trucks carrying uncut branches. City officials estimate the machine will bring about a saving up to 80 per cent over former costs for the hauling of tree branches.

The Southeastern Oakland County Garbage and Rubbish Authority (Detroit) recently made a survey of the disposal of tree trimmings and stumps in 39 large cities to find out how the problem was handled. Thirty-three of the 39 cities collect and dispose of shrubbery trimmings and tree limbs if properly bundled, some cities place a limitation on the size and weight of the bundles, and a few collect shrubbery trimmings but not tree limbs. Only 14 cities collect and dispose of tree trunks. One-fourth of the cities do not permit open burning of shrubbery and tree trimmings, although a few cities like Houston, Cleveland, Denver, and St. Paul permit burning at certain hours.

One-third of the 39 cities dispose of shrubbery trimmings and tree trunks at the city incinerator; another third use sanitary landfill method for disposal of tree trimmings; and the remaining cities use either open burning or open dump. Brush grinders or chippers are used to some extent in St. Louis, Milwaukee, Cincinnati, Kansas City, Oakland, Toledo, and Akron.

Merced, Calif., in connection with the adoption of a comprehensive shade tree ordinance, adopted the policy of providing an opportunity for the public to appear and protest against removal of objectionable trees. Only the city may trim or remove street trees and the park director is required each year in September to prepare a list of street trees which are to be removed during the following 12 months. A notice is put on each such tree and a notice is sent to abutting property owners. Objections to removal of street trees are heard at a public hearing after which the park and recreation commission makes its recommendation to the city council which also holds a public hearing and takes final action.

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